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During the transfer from conceptualizations to practical programs of educational innovation, difficulties, in the form of failure to close modular gaps, often occur. The author has constructed a functional model of research and systems development based upon logical sequencing and tight-line modular linkage between task assignment and implementation. The following nine modules are included in the paradigm: (1) task assignment, (2) conceptualization, (3) design, (4) simulation, (5) field trial, (6) monitored implementation, (7) evaluation, (8) implementation, and (9) projection. Each module is briefly discussed. The author believes this approach can help close the gap between theory and practice in research and systems development. (Author/JS)

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TECHNICAL MEMORANDUM 3

THE BARTLESVILLE SYSTEM

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TOTAL GUIDANCE INFORMATION SUPPORT SYSTEM

A THEORETICAL EXEMPLAR OF SYSTEM DESIGN, IMPLEMENTATION AND APPRAISAL

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Couched within the framework of procedures employed in systems development are two of the most difficult problems encountered by educational researchers. These two problems involve the design and appraisal of new innovations in education. This is especially true in connection with those innovations related to the application of computers and electronic devices.

Many seemingly innovative notions are generated from present day "educational thinkers," but when attempts are made to transfer these notions from mere conceptualizations into practical designs for implementation "something" happens. This "something" can probably best be described as the failure to close modular gaps and/or lack of proper sequencing of modules within the development paradigm.

Purpose

The purpose of this project was to construct a functional model of research and systems development based upon logical sequencing and tight-line modular linkage between task assignment and implementation. Basic to this task was the identification of the necessary modules to construct a theoretical framework to undergird a logical, comprehensive exemplar.

Methodology

On the basis of a comprehensive analysis (based on a review of the literature and personal observations of numerous on-going projects) of current practices, it would appear that present-day practices in research and systems development include a minimum of nine modules that can be logically sequenced into a functional model. The Paradigm of Research and Systems Development found in Figure I is an attempt to illustrate the modular structure of one such exemplar.

The model as shown in Figure I was postulated by the author in an attempt to logically sequence the various steps or types of activities one must complete before linkage between theory and practice can be realized. It may be noted that the model constitutes a hierarchical set of steps that serve as prerequisites to each other with built in appraisal and cycler capabilities for modification and re-design.

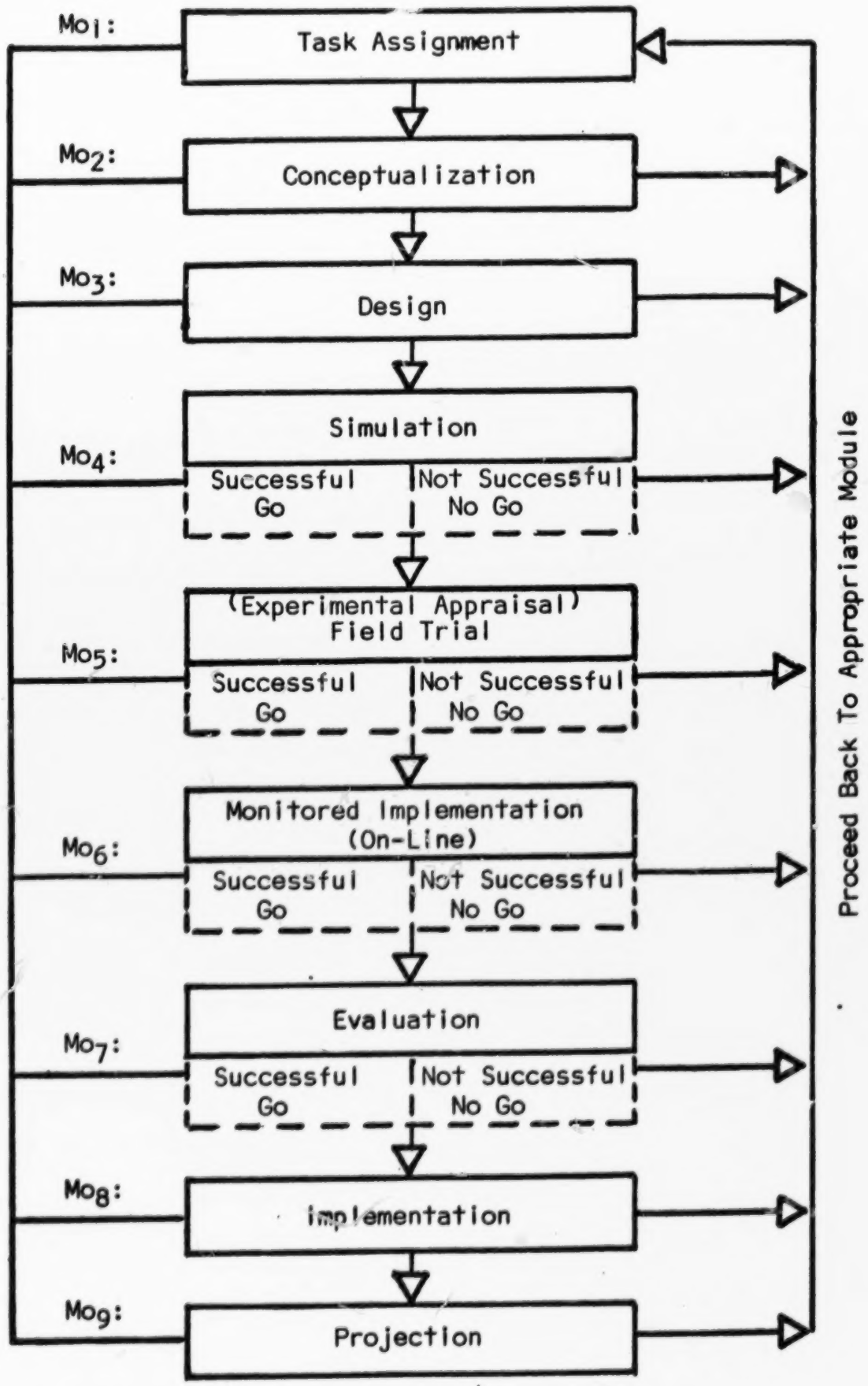
Taxonomy

Often the literature includes only fragmentary details concerning the logic and actual conceptualization of theoretical models. Therefore, in an effort to be more explicit, a taxonomy of modules affecting research and systems development was constructed. (See Figure 2). The taxonomy is a two-way classification table with module and step as it's major dimensions. It may be noted that the taxonomy constitutes a three by nine classification table which generates either single or combinational activities, each defined by some particular module logically sequenced within the paradigm.

Four of the modules involve planning activities. These represent projections, task assignments, conceptualization and design.

Figure I

PARADIGM OF RESEARCH AND SYSTEMS DEVELOPMENT IN EDUCATION



Three of the modules represent activities related to appraisal and evaluation. These include simulation, field trial, monitored implementation and evaluation of which two (field trial and monitored implementation) involve combinational activities encompassing both appraisal and providing for limited implementation.

Today's modern institutions that suscribe to a philosophy of systematic planning are constantly projecting future development and advance systems design. From these projections come many varied task assignments in the field of research and systems development.

Task Assignments are usually generated as a result of new designs and developments becoming available or problem areas being identified. Within the confines of this module a number of activities are found. These range from mere descriptions of general conditions and needs to determining objectives, task elements and statements of general significance. Although this module seems rather unimportant at times, it is basic to conceptualizing the various tasks to be accomplished in terms of specific objectives.

Conceptualization involves operationalizing and laying the groundwork for planning, organization, and designation of a task-force composed of research and systems development personnel, liaison personnel, advisory, technical and consultant personnel. This module is very important in terms of the development, refinement and evaluation of the assigned task. More specifically, it is a must in grouping the necessary task-force to carry out adequate systems design.

Design is one of the most important modules within the paradigm. It is within the confines of this module that designs are

Figure 2

TAXONOMY OF MODULES AFFECTING RESEARCH
AND SYSTEMS DEVELOPMENT

Module	Step		
	Planning	Appraising	Providing
Task Assignment	Description of Problem Statement of Objectives Identification of Task Elements Statement of Significance		
Conceptualization	Developing a Rationale Planning Organization Task Force Design Designation of Personnel Operationalizing		
Design	Objectives Parameter Estimation Specifications Model Formulation Flow Charting of Logic Simulation Design		
Simulation	Controlled Runs Performance Testing Synthetic Extraction Systems Analysis Verification of Analytic Solutions	Analysis of Simulation Data Error Checking Validation	

Figure 2 (Cont.)

TAXONOMY OF MODULES AFFECTING RESEARCH
AND SYSTEMS DEVELOPMENT

Module	Step		
	Planning	Appraising	Providing
Field Trial		Testing Experimental Appraisal Controlled Performance	Controlled Performance in actual practice Controlled Conditions
Monitored Implementation		Testing Transmission Analysis Validation of System Refinement Intensity Analysis	Controlled On-line Operations under Real Environmental Conditions
Evaluation		System Performance Testing Behavioral Research	
Implementation			Maximum On-line Operations Real Environmental Conditions
Projection	Problem Identification Innovation Productive Thought Advance Systems Design		

constructed to meet the objectives as specified in the conceptualization module. It becomes even more important when one considers that all designs will be evaluated against the original task assignment and the task-force conceptualization.

Simulation becomes the next logical module in the sequence. It is through this process that designs are tested for desirability in terms of results. Should the design be found undesirable it should be returned to the design module for additional analysis, modification, and re-design. Such a looping procedure is continued until simulation criteria are met. Upon meeting simulation criteria it is allowed to proceed to field trial.

Field Trial represents a control on performance and conditions expected in actual practice. Should field criteria not be met, the task is then returned to the appropriate preceding module within the paradigm. However, should field criteria be met, a complete experimental appraisal is made. Following completion of a successful appraisal, the design is then implemented under actual conditions on a monitored basis.

Monitored Implementation refers to the process of controlling operations until the new system meets all the preceding objectives and operational responsibility can be transferred to the appropriate authority. It should be noted however, that even after an orderly phase-out of the developmental responsibility has been made and the authority has been transferred, the original designers are still obligated for consultive assistance in connection with the operations, continuation and integration of the new system.

Evaluation of the system is the seventh module within the paradigm. It is within this module that efforts are made to determine the degree to which design performance meets the original objectives. If evaluation indicates that design performance is not within an acceptable range, it becomes the responsibility of the task-force to recommend the appropriate development module, i. e., design, simulation, field trial, or monitored implementation. Should the evaluation indicate the design is successful within an acceptable performance range, the decision can then be made for implementation.

Implementation represents the ultimate module within the exemplar. It is within this module that new systems take on meaning and begin to provide those services or capabilities necessary to link theory with practice in the logical solution of a problem. Once the problem has been solved through new systems development, one can begin to formulate projections for the future.

Projection is the bridging process between old problem solutions and the generation of new innovations for reaching new and more exciting horizons. This module acts as the catalyst between innovative productive thought and task assignment and serves as the cyclic linkage to complete the nine modular paradigm.

Discussion

The model illustrated in the foregoing pages offers a systematic approach to closing the gap between theory and practice in research and systems development. Although it can be used as a logical approach to the solution of many problems, the author does

not view it as the way to make illogical or impractical innovations take on realistic meaning.

It should be noted that the model here illustrated has the potential for helping the researcher develop tight-line organization and to overcome many of the pitfalls encountered in the field of systems development. Hopefully, it will help researchers to operationalize a task-force approach to problem solution. Specifically, it should help develop an understanding of the modular structure of a rather inclusive research paradigm.